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been built to replace the old remodeled cars, three of which, however, are still in use. Five auto trucks are also maintained for training work and for emergency use in the event of mine disaster. Other departments are the fuels section, the electrical section, the mechanical section, the chemical section, the analytical laboratory, the gas laboratory, the gas-mask laboratory, the natural gas research unit, the microscopic research unit, the petroleum laboratory, the explosives chemical laboratory, the metallurgical and metallographic laboratories, and the physical laboratory, the experimental mine near Princeton, Pa., explosive section and the administrative section.

THE BUREAU OF MINES AND JAMES AUSTIN HOLMES

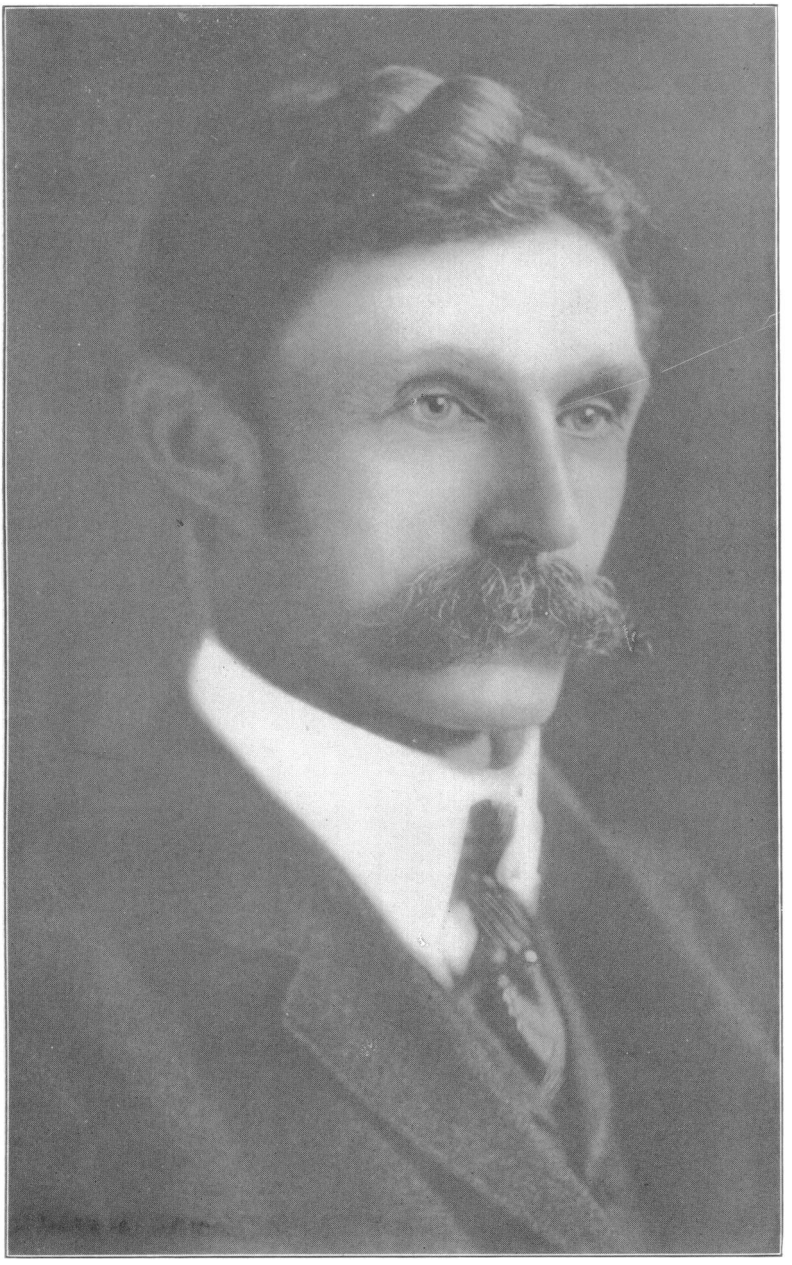
THE work of the U. S. Bureau of Mines, as defined in the legislation creating it, is to conduct scientific and technologic investigations concerning mining and the preparation of mineral substances with a view to the increase of health, safety and efficiency in the mineral industries. Its work has two phases: investigative, to determine the best procedure along these lines; and cooperative, to assist industry in utilizing to the fullest practicable degree the improved practises thus developed. To the latter end it welcomes the cooperation of operators, workmen's organizations, commercial bodies, technical societies, state and other government officials, and every one who is interested in the advancement of the mining and metallurgical industry.

The research branch has charge of investigation which is chiefly carried on in the experiment stations, although a large part is performed in the field. For purposes of technical supervision, there are five divisions of the research work; mining, metallurgical, petroleum, mechanical equipment (which includes the utilization of fuel) and mineral technology.

The operations branch carries on the cooperative work of the bureau that has been initiated by the research branch. The division of mine rescue cars and stations carries on mine rescue and first aid work at actual disasters, trains thousands of miners yearly to perform such work, and promotes interest in safety in mining through every means at its command. The division of education and information facilitates the making available to the mining public of the work done by the other branches, through publication of researches and statistics, exhibits, motion pictures, and the dissemination of information as to the laws governing the mining industry.

The foundation of the bureau was due in large measure to the efforts of the late Professor James Austin Holmes. When state geologist of North Carolina, he was chosen to organize the department of mines and metallurgy of the Louisiana Purchase Exposition at St. Louis. His creative imagination saw there an opportunity to secure results of permanent value through the analyzing and testing of the coal resources of the United States and of structural materials in connection with the exhibition, and this was done under the direction of a commission of which he was a member. After the close of the exposition the work was continued under his charge. The testing plant was subsequently transferred to the Jamestown Exposition and finally to the Arsenal grounds at Pittsburgh. In 1907 the technologic branch of the U. S. Geological Survey was organized with Dr. Holmes in charge.

At that time the United States had the unenviable distinction of



JOSEPH AUSTIN HOLMES,
The first director of the Bureau of Mines.

being not only the most prodigal nation in the expenditure of national resources, but of the lives of its citizens as well. Its leading place in the production of all the principal mineral substances was accompanied by a wanton loss of life and of health. In 1907 there was an unusual number of mine explosions, and the result was a general movement to take steps to prevent the needless loss of life. These culminated in the creation of the Bureau of Mines, in 1910, for the purpose of increasing health, safety, and efficiency in the mining industry. Dr. Holmes was appointed director and retained the position until his untimely death in 1915.

Starting the work at Pittsburgh placed it in the center of an important mining and metallurgical region. Though the work of the bureau was at first housed in temporary and unsuitable quarters, Dr. Holmes had a vision of a great experimental station for mining, where all kinds of accidents could be studied, and methods developed for their prevention, which miners and operators alike could feel was their station and could come to for information and education. It was also his conception that this station should help to stop the waste in mining resulting from the inefficient methods employed and the excessive competition in the coal industry. To this end he foresaw the need for research laboratories for chemical and physical investigation of gases, explosives and mineral substances, and equipment for the testing of mine lamps and other machinery, and finally, of the establishment by the bureau of such agencies as would result in the training in the use of rescue apparatus and in giving first aid to the injured. The fruition of Dr. Holmes's work is the experiment station which has now been dedicated.

THE BRITISH NATIONAL PHYSICAL LABORATORY AND SIR RICHARD GLAZEBROOK

As Dr. J. A. Holmes was mainly responsible for the establishment and development of the Bureau of Mines and Dr. S. W. Stratton is for the Bureau of Standards, so in England Sir Richard Glazebrook has been director of the National Physical Laboratory since its inception. He retired on September 18, his sixty-fifth birthday, and is succeeded by Professor J. E. Petavel, professor of engineering and director of the Whitworth Laboratory in the University of Manchester.

The London *Times* remarks that "Sir Richard Glazebrook has controlled the fortunes of the National Physical Laboratory from its small beginnings in 1899 to its present great place in the scientific organization of the nation. It was first intended merely to carry out investigations required in connection with the manufacture and testing of instruments of precision, and in 1902, when it was moved to new buildings at Teddington, it had only two departments and a staff of twenty-six. It has now seven scientific departments, a secretariat, and a staff of over 600 persons. These deal with heat, optics, acoustics and molecular physics, with electricity, metrology, engineering, metallurgy, the forms of ships and aerial machines, and aero-dynamics. It gives advice on all questions involving the physical properties of matter, the strength and quality of materials, gauges and standards. During the war it rendered invaluable service. In the financial year ending in March, 1918, the Ministry of Munitions alone paid it £42,000 for work done, and the expenditure was not on manufacture, but merely on examining and testing. Until last year the Royal Society was the